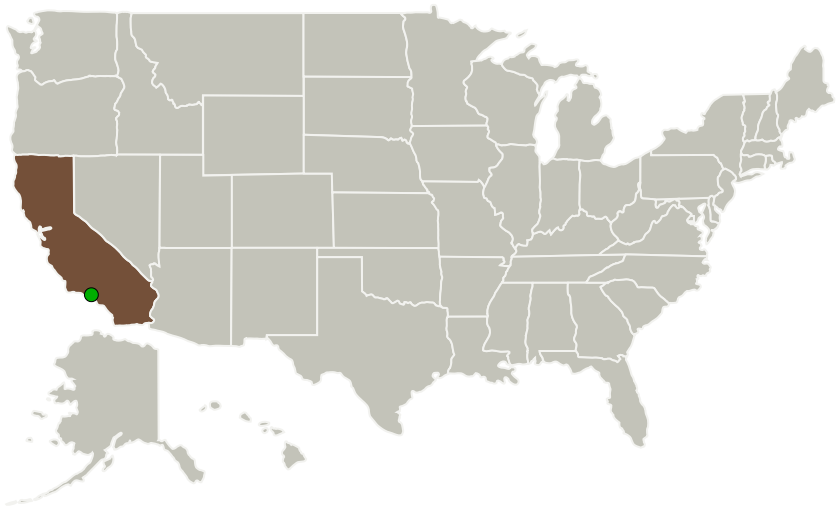
Compact Chemical Monitor for Spacecraft Water Recovery Systems, Phase I

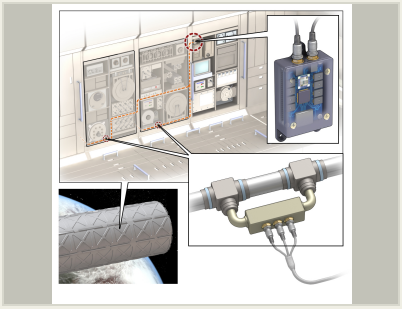
Completed Technology Project (2016 - 2016)

Project Introduction

The International Space Station (ISS) requires lightweight, low-power, easy-to-use, accurate, and stable sensor technology for monitoring wastewater content to ensure proper functioning of the ISS Environmental Control and Life Support System (ECLSS). In particular, continuous and unattended pH, Ca2+, and conductivity monitoring in the Urine Processor Assembly (UPA) in use in the ISS Water Recovery System is required. At present, no such sensor technology exists that can satisfy the demanding operational requirements of the ISS and future exploration missions. Intelligent Optical Systems (IOS) proposes to develop a luminescence-based optical sensor probe to monitor calcium, conductivity, and pH levels directly in ISS wastewater in real time. Optical sensors are superior to electrochemical ones in terms of robustness, reliability, and maintenance. These advantages are most notable in corrosive aqueous environments. Our monitor will incorporate robust sensor elements, interrogated via a compact, low-power optoelectronic unit. The proposed sensors will be remotely connected to the electronic circuitry by an electromagnetic interference (EMI)-proof optical fiber cable. For space systems control, miniature fiber optic sensors connected to the electronic circuitry by an optical fiber cable allow greater flexibility in placing the sensor system in the ISS, where space is highly valuable. Our flow-through monitor will include optical sensors for calcium and pH sensing based on previous sensor technologies developed at IOS. IOS will also incorporate a miniature conductivity sensor into the sensor probe system. In Phase II we will produce prototypes for integration in a Urine Processor Assembly and conduct extensive testing under simulated environmental conditions, culminating in delivery to NASA of a monitoring system, bringing the monitor to TRL 7.

Primary U.S. Work Locations and Key Partners





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Completed Technology Project (2016 - 2016)

Organizations Performing Work	Role	Type	Location
Intelligent Optical Systems, Inc.	Lead Organization	Industry	Torrance, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

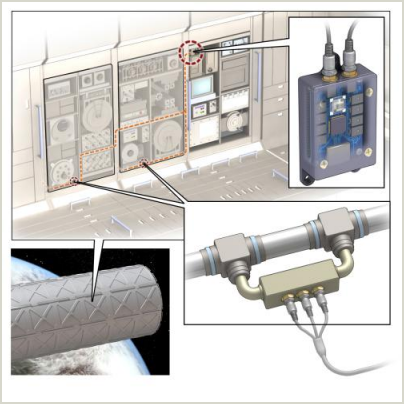
June 2016: Project Start

December 2016: Closed out

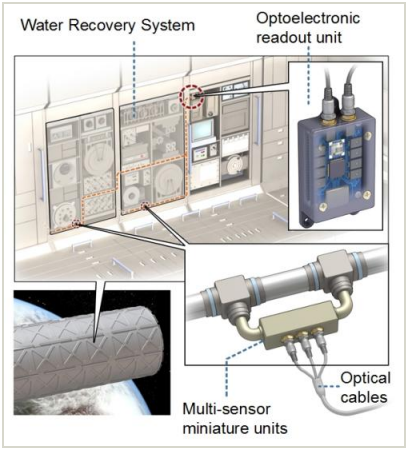
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139608)*

Images



Briefing Chart Image
Compact Chemical Monitor for Spacecraft Water Recovery Systems, Phase I *(https://techport.nasa.gov/image/128595)*



Final Summary Chart Image
Compact Chemical Monitor for Spacecraft Water Recovery Systems, Phase I Project Image *(https://techport.nasa.gov/image/128822)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Intelligent Optical Systems, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

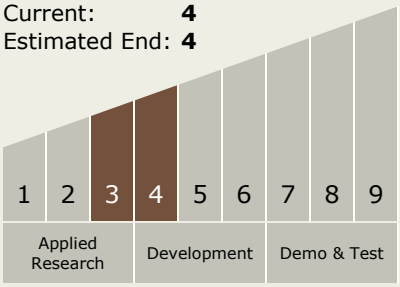
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Jesus D Alonso

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Compact Chemical Monitor for Spacecraft Water Recovery Systems, Phase I

Completed Technology Project (2016 - 2016)

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.4 Environmental Monitoring, Safety, and Emergency Response
    - TX06.4.1 Sensors: Air, Water, Microbial, and Acoustic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System